Glucose Monitoring

ALLISON BRUNNER, MSN, RN, CDCES

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Disclosure

The presenter, Allison Brunner, has no conflicts of interest to disclose with relation to the topic being presented today.

Learning Objectives

- Summarize the purpose of glucose monitoring
- Discuss barriers to glucose self-monitoring, and strategies to minimize these
- Differentiate between personal and professional continuous glucose monitoring options.
- Cover how “time in range” and coefficient of variation are changing the way we look at glucose data

Blood Glucose Meters of Today

- Faster (<5 seconds)
- Use much less blood (0.3 microliters)
- More convenient (no water or extra steps)
- Accessibility features (language, backlighting, audio)
- More functions (can download, add “notes”, prompts)
- No calibration

Glucometer Accuracy

Results of a study conducted by The Diabetes Technology Society, 2016-2017

Brand/Model	N	% in limits		Brand/Model	N	% in limits
Contour Next (Bayer)	311/312	100%		OneTouch Ultra2	280/311	90%
AccuChek Aviva Plus	306/311	98%		Walmart ReliOn Ultima	285/319	89%
WalMart ReliOn Confirm	307/317	97%		Bayer Contour Classic	284/320	89%
CVS Advanced	307/318	97%		Omnis Health Embrace	282/319	88%
Abbott Freestyle Lite	298/312	96%		Nipro True Result	279/318	88%
AccuChek Smart View	305/320	95%		Nipro True Track	167/205	81%
WalMart Relion Prime	288/312	92%		Biosense Medical Solus	244/320	76%
OneTouch Verio	294/319	92%		Advocate Redi-Code	241/319	76%
Prodigy Auto Code	282/312	90%		Gmate Smart (Philosys)	226/320	71%

FDA requirements - 2019

- 95% of values must be within +/- 12% for blood sugars above 75mg/dL
- 98% must be within 15%

Klonoff, DC et al. August 2018. Investigation of the Accuracy of 18 Marketed Blood Glucose Monitors. *Diabetes Care*, 41, 1681-1688.

Barriers to Patients Self-Monitoring BG

Barrier	Possible Solutions/Helps
Physical	Prescribe special meter, lancet device or CGM
Financial	Ensure preferred brand, consider generic
Cognitive	Teach and reteach, simplify regimen
Lack of Understanding	Explain relevance, ask questions
Lack of HCP Support	LOOK at data, discuss values and recognize efforts
Time/Schedule	Optimize testing schedule, coordinate with patient
Lack of Convenience	Prescribe a 2nd meter; place meter in easy spot
Privacy Issues	CGM, optimize testing schedule
Emotional/pain	Technique/equipment; help pt view BGs differently

Tenderich, A. (2013). Use of blood glucose meters among people with type 2 diabetes: Patient perspectives. *Diabetes Spectrum, 26*(2):67-70

Swigert, T. (2013). Blood glucose monitoring: Overcoming the obstacles. *AADE In Practice, 28-34*

Tips for Self-Monitoring BG

- Set lancet dial to lowest number needed to get a drop
- Wash hands with warm water and soap rather than alcohol
- Use side of finger vs pad (see photos)
- Talk to patients about sharps disposal

Don’t poke the pad! Ouch!

Poke the side of the finger!

More Tips for Self-Monitoring BG

DO's

- Store supplies as directed
- Change lancet every time!
- Rotate sites
- Check time & date of meter (especially after battery change!)
- Bring meter or logbook to every visit

DON'Ts

- Share your meter or lancets
- Use expired test strips
- Expose strips to air, heat, humidity or light
- Over-milk your finger

CONTINUOUS GLUCOSE MONITORS

- Medtronic Guardian
- Dexcom G6
- Libre 2 or 14 day Libre

Continuous Glucose Monitoring

- Small and inconspicuous
- Measures glucose in interstitial fluid (versus blood)
- New glucose data every 5 minutes!
- Gives glucose AND glucose trend (direction)
- Now integrated into some pump systems
- Fingerstick calibration requirements vary
- Sensor worn for 7 to 14 days (10-14 for “Pro”)

- Can be expensive (not covered for all patients)
- Now Bluetooth enabled (some systems)
- Accuracy has improved significantly
- Future uses: inpatient, artificial pancreas
- **Patients still need their meters!**

CGM Options - Medtronic

Medtronic Guardian Connect®

- 60-min predictive high/low
- iPhone/smart watch is the receiver with push alerts
- Rechargeable transmitter (lasts for a year or more)
- 2+ calibrations per day
- 7 day wear
- Not covered by Medicare

- **Medtronic Guardian®**
- With pump only (670G or 770G)
- 2 calibrations per day
- 7-day wear
- Not covered by Medicare

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CGM Options - Dexcom

Dexcom G6®

- Bluetooth enabled: links to a "receiver" or cell phone app (not compatible with all phones)
- Customizable alerts
- Can share data with clinic or "followers"
- 10-day wear

- NO fingerstick calibrations required; instead, must enter a 4-digit code for each new sensor
- 2-hour warm-up
- Easy inserter device
- Can be used alone or with Tandem pump
- More accurate in low ranges that other options

CGM Options – Freestyle Libre

Freestyle Libre 14 day®
(Also sometimes called "Libre 1")

- Works with reader or cell phone app
- Does not have alarms

Freestyle Libre 2®

- Works with reader only
- Has alarms

Both have these features

- 14-day wear
- Easy insertion
- 1-hour warm-up
- Available at most pharmacies
- Least expensive CGM option

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Pro CGM Options – Libre & Dexcom G6

Libre Pro

- 14 day wear
- Data is logged in the device, nothing for patient to carry
- Disposable applicator
- Placement done in office
- Removal/download can be done in office or pt can mail back

Dexcom G6 Pro

- 10 day wear
- Can be “blinded” or “unblinded”
- Blinded - Data is logged in the device, nothing for patient to carry
- Unblinded – connects to patient’s phone through app
- Disposable applicator
- Placement done in office
- Removal/download can be done in office or unblinded
  patients can send data via Clarity

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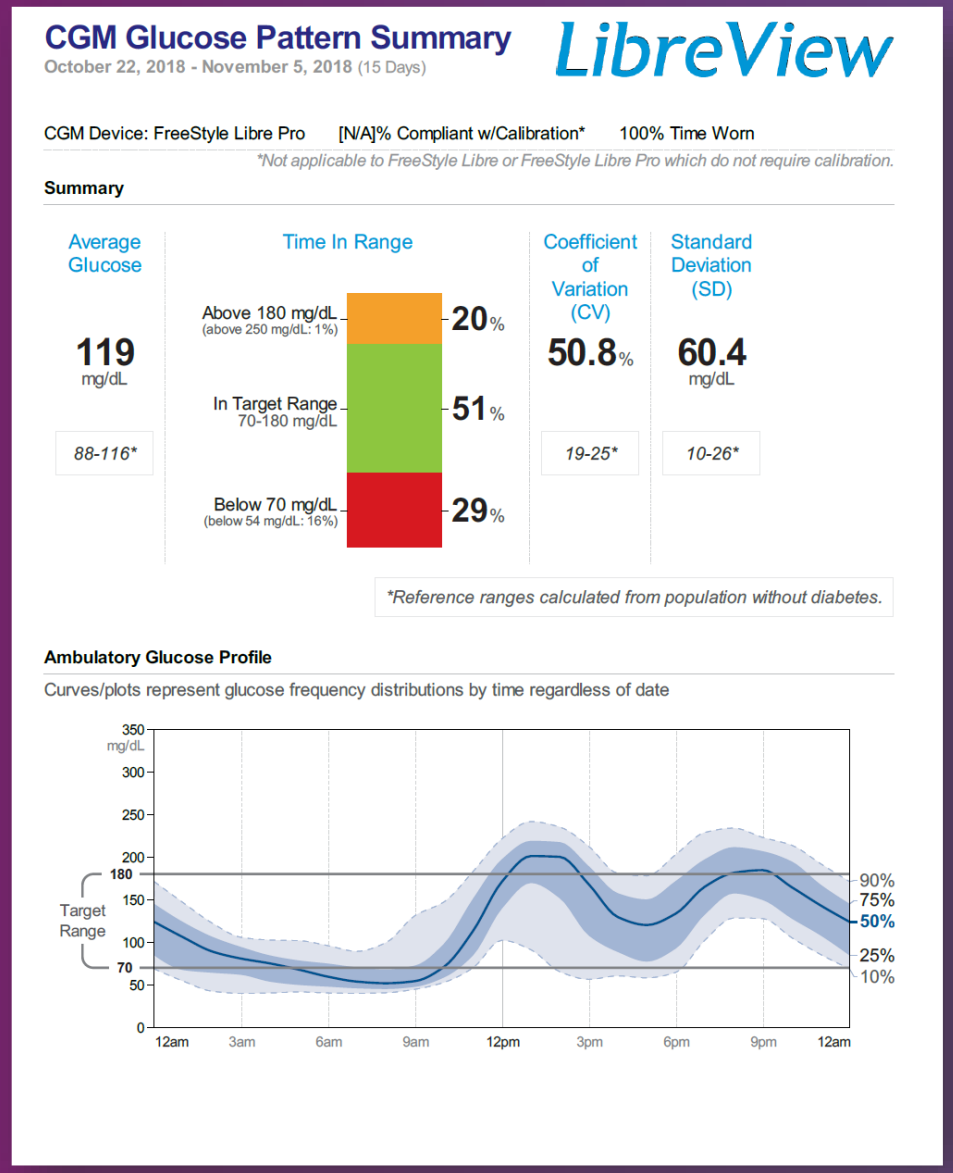
CGM Reports



CGM Glucose Pattern Summary
October 22, 2018 - November 5, 2018 (15 Days)

LibreView

CGM Device: FreeStyle Libre Pro [N/A]% Compliant w/Calibration* 100% Time Worn

*Not applicable to FreeStyle Libre or FreeStyle Libre Pro which do not require calibration.

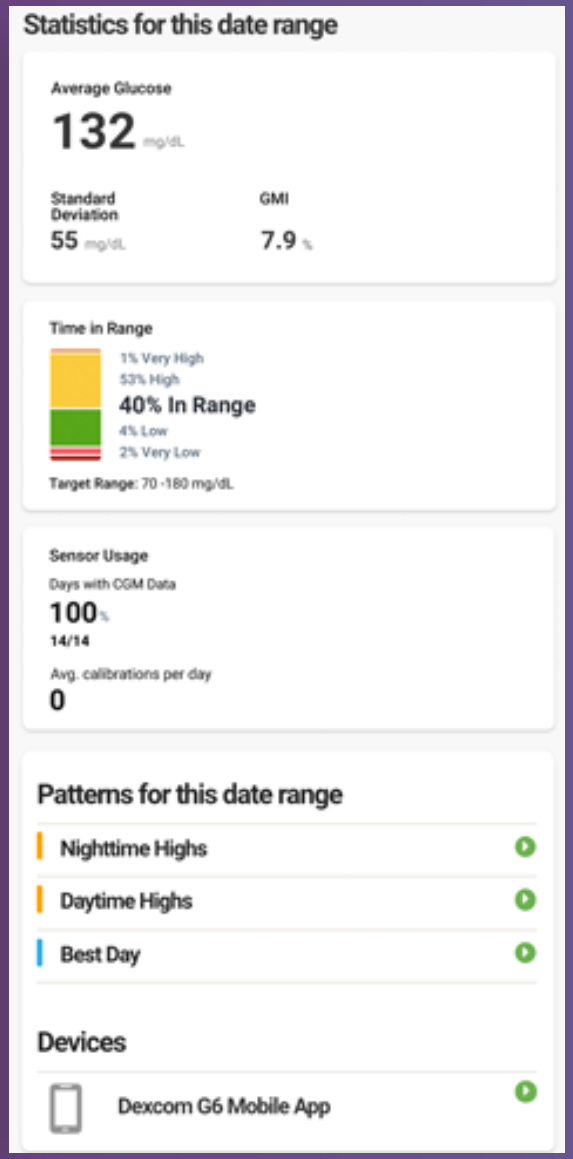
Summary

Average Glucose	Time In Range	Coefficient of Variation (CV)	Standard Deviation (SD)
119 mg/dL	Above 180 mg/dL (above 250 mg/dL: 1%) 20%	50.8%	60.4 mg/dL
	In Target Range 70-180 mg/dL 51%		
	Below 70 mg/dL (below 54 mg/dL: 16%) 29%		
88-116*		19-25*	10-26*

*Reference ranges calculated from population without diabetes.

Ambulatory Glucose Profile

Curves/plots represent glucose frequency distributions by time regardless of date



Statistics for this date range

Average Glucose
132 mg/dL

Standard Deviation
55 mg/dL

GMI
7.9 %

Time in Range
1% Very High
53% High
40% In Range
4% Low
2% Very Low
Target Range: 70 -180 mg/dL

Sensor Usage
Days with CGM Data
100 %
14/14
Avg. calibrations per day
0

Patterns for this date range

- Nighttime Highs
- Daytime Highs
- Best Day

Devices

Dexcom G6 Mobile App

Formats are different, but all include:

- Time in Range- TIR
- Coefficient of Variation – CV
- Trends
- Daily view
- Analysis of number of hypo events

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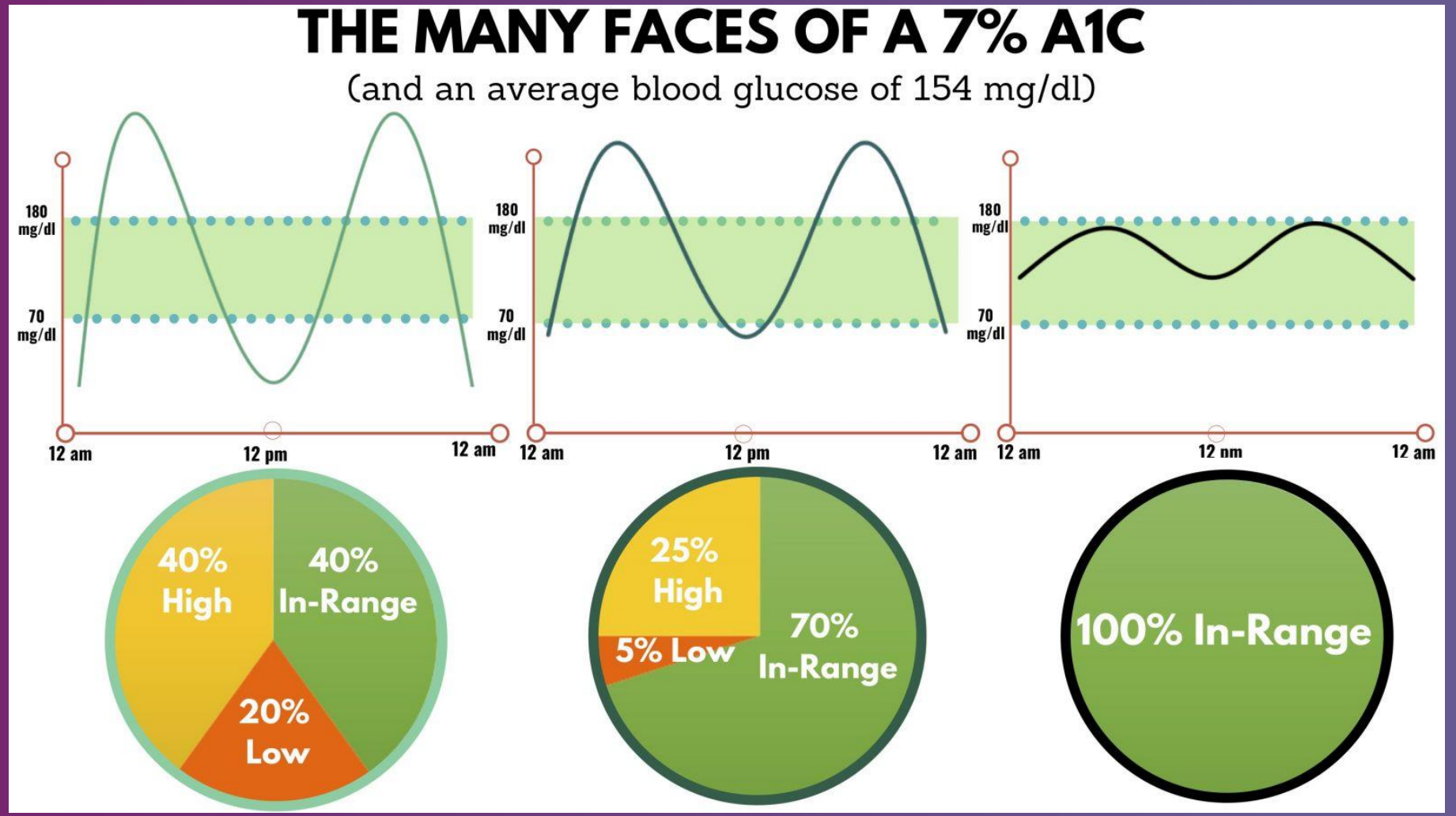
Why TIR matters!



Professional CGM Billing

- Medicare and most private insurances are covering professional CGM.
- Insurance, incl. Medicare, covers this procedure (sensor placement and interpretation) for DM.
  - CGM Placement/Removal/Reporting (code 95250): can be done by RN, MA, etc. Estimated reimbursement approx. $250
  - CGM data analysis and interpretation (CPT code 95251) can be added to E/M service or done independently. Can be used for clinic-provided (pro) system or patient-provided (personal) system. Can not be billed more frequently than every 30 days.
- For more info: https://provider.dexcom.com/coding
- Need at least 72 hours of data to bill.

References

1. American Diabetes Association (2020): Standards of medical care in diabetes–2018. *Diabetes Care, 37(1), S14-S61*
2. Swigert, T. (2013). Blood glucose monitoring: Overcoming the obstacles. *AADE In Practice, 28-34*.
3. Tenderich A. (2013). Use of blood glucose meters among people with type 2 diabetes: patient perspectives. *Diabetes Spectrum, 26*(2):67-70

QUESTIONS?